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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : H04L 23/00 | A1

(11) International Publication Number: WO 98/12846

(43) International Publication Date: 26 March 1998 (26.03.98

(21) International Application Number: PCT/US97/16429

(22) International Filing Date: 16 September 1997 (16.09.97)

(30) Priority Data:
60/026,230 18 September 1996 (18.09.96) US

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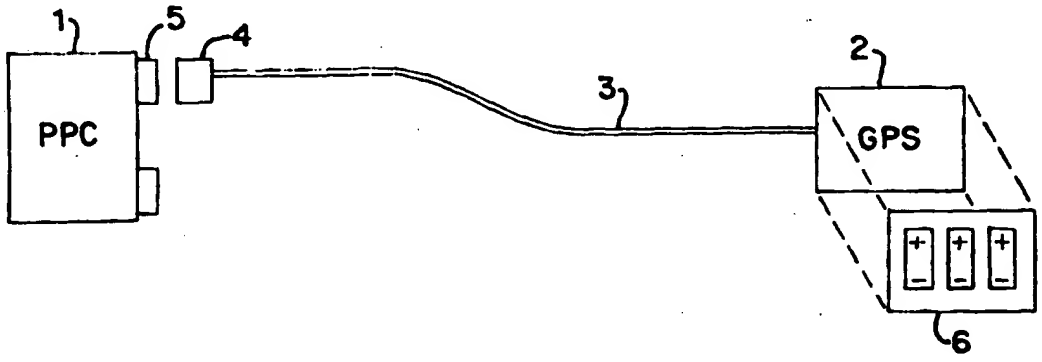
(81) Designated States: CA, JP, MX, European patent (AT, BE CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL PT, SE).

Published
With international search report.
Before the expiration of the time limit for amending th claims and to be republished in the event of the receipt c amendments.

(54) Title: GPS POWER/DATA CABLE SYSTEM



(57) Abstract

A device for coupling global positioning system (GPS) receivers (2) to computer systems (1) in a way that takes advantage of availabl power supplies. The device includes an adaptive power base (15) that may be used to replace the standard battery-pack bases (6) of man GPS receivers. The adaptive power base (15) is coupled through an interface cabling system to an external power supply. The powe supply may be associated with the computer (1) means, such as a mouse or keyboard port (5), or it may be a completely separate sourc such as an automobile's cigarette lighter outlet (12). The interface cabling system includes coupling for linking the data communicatio ports (2, 3, 4, 5) of the GPS receiver and the computer system together. Through the design of the present invention, the GPS (5) receiv is more adaptive to available power sources and therefore may be used for longer periods of time and in a variety of locations. The desig is simple in that it includes standard connectors (205, 215).

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GPS POWER/DATA CABLE SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to position sensor devices such as Global Positioning Satellite (GPS) receivers as portable personal computer (PPC) accessories or peripherals. More particularly, the present invention relates to the coupling of such receivers and computers for data transfer and for supplying power.

2. Description of the Prior Art

In this disclosure, "portable personal computer" or "PPC" includes state-of-the art laptop, notebook and personal digital assistant (PDA) personal computers. In a typical embodiment, geographical information, mapping and/or travel information software is being used on the PPC typically in a vehicle or by the user on foot or at a remote location absent conventional "house current" such as 110 volt AC electrical power outlets standard in residences and workplaces in the United States. Use of the geographic software is enhanced by "real-time" geographic coordinate data supplied by a GPS receiver, for example, the latitude/longitude (lat/long) for the user's present location. For example, in conjunction with a GPS receiver, the PPC can display and update the user's location on computerized maps or in other geographic information formats.

To function as peripheral accessories in conjunction with a PPC, state-of-the art GPS receivers need an electric power source, typically, within the ranges of 4 to 40 volts DC and 0.1 to 3.0 amps DC. A data link, typically a serial data input/output cable, is also required for communication between the GPS receiver and the PPC of the standard lat/long, speed, direction of travel and precise time signals or data as well as initialization routines and other data exchange. What is needed is a device that facilitates the necessary electrical power supply to the GPS receiver along with the data connection or link between the GPS and PPC through a system or set of options which address

the needs of non-technical users in the major settings of in-vehicle and remote portable use.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a system capable of supplying power from several sources and also capable of providing data communication interfacing. That is, the present invention is designed to enable use of GPS as a PPC accessory in the typical settings of portable computer usage -- such as use in a remote setting or in the field or "on foot" without any external electric power supply, and/or in a vehicle such as an automobile or small marine craft equipped with typically a standard 6 to 12 volt DC power supply available by means such as "cigarette lighter" receptacles or outlets, and/or temporary usage as a "desktop" personal computer in typical home or workplace settings with external power provided to the PPC by means of a 110-120 volt AC to 6-12 volt DC transformer/adapter. Furthermore, the present invention is designed to enable "easy" changeover between settings: e.g. shifting from "desktop" use at the office or in the home to in-vehicle use and/or changing from a reliable set-up in the user's car or boat to completely "free" or remote portable use in the field with the GPS receiver powered either by its own standard batteries or by the PPC battery pack. It is desirable to provide alternative power sources for the GPS receiver to conserve the PPC batteries in remote settings. But, at the same time, options for powering the GPS through the PPC external or internal power supply are useful for longer periods of operation in a vehicle, for example, or in case the standard GPS batteries wear out while PPC battery power still happens to be available, and so forth.

A main object of the present invention, therefore, is first to enable the unsophisticated user to connect up the GPS receiver peripheral or accessory to typical PPCs with minimal effort and technical challenge using fairly familiar equipment like standard batteries and communications or COM port cabling and connections. A second object is to provide for longer periods of operation and easy installation and shifting between regular in-vehicle use and use on foot or in a remote location by means of various accessory power and data

cable options, typically provided as extra kit at low-cost. A third object is to avoid damage to the standard GPS battery power supply due to accidental connection to an external power source.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1A is a diagrammatic perspective view of the basic simple set-up of the system of the present invention with the GPS internally powered by standard batteries and a data communication cable connection to a COM port on the PPC (portable personal computer).

FIGURE 1B is a diagrammatic perspective view of the first type of alternate optional cable, providing data communications between GPS and a COM port of the PPC, plus electric power for the GPS from a typical external source, such as a vehicle cigarette lighter outlet, and to the GPS receiver with an alternative external power base attached.

FIGURE 1C is a diagrammatic perspective view of the second kind of alternate optional accessory cable, providing data communications between GPS and a COM port of the PPC, plus electric power for the GPS from the standard mouse/keyboard port of the PPC to the GPS receiver with an alternative external power base attached.

FIGURE 2A is a side view of the GPS receiver with the removable standard battery power base or bottom cover.

FIGURE 2B is a side view of the GPS receiver with the optional removable external power base or bottom cover.

FIGURE 2C is a diagrammatic view of an external power cable for coupling to the optional removable external power base or bottom cover.

FIGURE 3A is an external physical layout of the first type of optional accessory data/power cable and fittings for powering the GPS from an external power source such as a 9-12 volt DC cigarette lighter outlet in a boat or car.

FIGURE 3B is a schematic wiring and pin diagram of the first type of optional accessory cable and fittings shown in **FIGURE 3A**.

FIGURE 4A is an external physical layout of the second type of optional accessory cable and fittings to get power for GPS from mouse/keyboard port on the PPC.

FIGURE 4B is a schematic wiring and pin diagram of the second type of optional accessory cable and fittings shown in **FIGURE 4A**.

FIGURE 5A is a physical layout schematic wiring diagram of the jumper arrangement or three-position male connector for power source on GPS printed wiring board or PWB, facilitating safe and ready connection to alternative GPS bottom covers or power bases – plus a schematic wiring diagram of standard GPS data/power cable and fitting.

FIGURE 5B is a physical layout schematic wiring diagram of the standard battery power base for GPS receiver, showing the three-position female connector.

FIGURE 5C is a physical layout schematic wiring diagram of alternative, optional external power base for the GPS receiver, showing the three-position female connector.

DESCRIPTION OF THE PREFERRED EMBODIMENT AND THE BEST MODE OF THE INVENTION

FIGURES 1A, 1B and 1C show simplified overviews of electric power and data cabling alternatives to link a PPC **1** with a GPS receiver **2**. The GPS receiver has a standard data/power cable **3** and connector fitting **4** attached -- as detailed further relative to **FIGURE 5A** hereinafter.

FIGURE 1A reveals the simplest cabling arrangement in which electric power is provided to the GPS receiver **2** by means of a removable standard battery power base **6**. Data communications between the PPC **1** and the GPS receiver **2** are provided by the data/power cable **3** by making a standard connection between the attached fitting **4** and the COM port **5** on the PPC **1**. Note that the electrical power transmission capability built into the data/power cable **3** is not actually used in the arrangement shown in **FIGURE 1**. The cabling arrangement in **FIGURE 1** functions for remote use of the linked GPS and PPC i.e. in the absence of an external power source. It also provides for a ready and easy installation for technically unsophisticated users who are nonetheless familiar with standard batteries such as "AA" batteries available at most retail stores and their installation in everyday portable appliances, toys, radios and so forth. The user only needs further to understand or learn how to manage the simple COM port connection at **4** and **5**, comprising one of the most common and easy personal computer cable connecting tasks. Thus, **FIGURE 1A** illustrates a data/power cabling arrangement preferred for the basic mass-market PPC peripheral GPS receiver product.

FIGURES 1B and **1C** illustrate additional data/power cabling alternatives for supplying external electrical power to the GPS receiver **2** functioning as a PPC peripheral. Both electric power and data signals are transmitted through the standard data/power cable **3** attached to the GPS receiver **2**. The alternatives pictured in **FIGURES 1B** and **1C** also require another accessory, namely, an alternative removable external power base **15** as installed by the user on the GPS receiver **2** in place of the standard battery power base **6** in **FIGURE 1A**. Further details are provided below in this disclosure relative to **FIGURES 2A, 2B, 5A, 5B** and **5C**.

FIGURE 1B particularly shows a first optional added cable 8 with a separate power cable 9 and fitting or connector 12, plus a separate data cable 10 and fitting or connector 11. The separate power and data lines are joined in a "Y" configuration at an adaptation connector or fitting 13 -- such that both power and data are fed through the standard data/power cable 3 attached to the GPS receiver 2. The optional cable 8 transmits data between the GPS receiver 2 and the PPC 1 by connecting to the PPC COM port 5 at 11. External electric power is supplied at 12, for example, by a standard connector, plug or fitting for use with a cigarette lighter receptacle or outlet as commonly found in automobiles and other personal vehicles. Thus, the FIGURE 1B cabling alternative 8 facilitates an external power source for the GPS receiver 2 for extended use or in case standard replaceable batteries for the GPS receiver 2 have worn out, for example, for use of the GPS receiver 2 as a PPC peripheral in a vehicle.

FIGURE 1C specifically illustrates a second optional, added cable 20 also joined in a "Y" configuration at a GPS end or connector at 23. Data transmission between the GPS receiver 2 and the PPC 1 is also facilitated by another COM port connection at 21 and 5. But, the electric power for the GPS receiver 2 is provided in FIGURE 1C by connection at 22 to the extra keyboard/mouse port at 25 which provides about 5 volts DC and 0.01 to 0.3 amps DC of electric power for standard input/output peripherals such as a computer mouse or an extra keyboard on typical PPCs such as laptops, notebooks and PDAs. In this FIGURE 1C arrangement of cables, both data signals and electric power are transmitted by means of the data/power cable 3 attached to the GPS receiver 2.

FIGURES 2A and 2B present side views of the GPS receiver 2 according to the present invention. FIGURE 2A shows the GPS receiver 2 with a removable standard battery power base 210 or bottom cover, while FIGURE 2B shows an optional removable external power base 220 or bottom cover.

FIGURES 2A and 2B show several common GPS receiver features such as a top cover or outer case 200, a GPS printed wiring board (PWB) 202 comprising the essential integrated circuits of the GPS receiver 2, an attached

standard data/power cable **203** (also shown heretofor at **3** in **FIGURES 1A, 1B** and **1C**), and a power supply trunk **205** or three-position male connector for electrical power to the PWB **202**, as further detailed in **FIGURE 5A** hereinafter.

FIGURE 2A includes a side view of the standard battery power base or bottom cover **210** in which standard "AA" or equivalent sized replaceable retail batteries **207** are installed providing electric power to the PWB **202** through typical wiring and/or connections as shown at **215** and **205**. The wiring and connection of the standard battery base **210** shown in **FIGURE 2A** are further detailed hereinafter in relation to **FIGURE 5B**.

FIGURE 2B is a side view of the optional external power base or bottom cover **220**, which is installed to provide external power to the GPS receiver **2**, by means of an external power jumper **223**. For example, this external power jumper **223** may preferably be a three-position female connector as described in more detail relative to **FIGURE 5C** hereinafter. **FIGURE 2C** illustrates a preferred design of the external jumper **223**, in which power coupling **243** is designed to couple to three-position female connector **543** shown in **FIGURE 5C**.

FIGURES 3A and **3B** present further details pertaining to the first type of optional cable or connection shown more generally heretofore as cable **10** in **FIGURE 1B**. In **FIGURES 3A** and **3B**, one DB-9 female connector **311** corresponds to the connector **11** in **FIGURE 1B** for the PPC COM port. In **FIGURES 3A** and **3B**, data **310** and power **309** sides of the cable **10** arrangement are joined in a "Y" configuration at the GPS end or connector **313**, specified as a DB-9 male connector, and corresponding to coupling **13** in **FIGURE 1B**. An external power coupling **312** in **FIGURES 3A** and **3B**, may be a dual-leaf cigarette lighter plug, corresponding to plug **12** in **FIGURE 1B**. In the **FIGURE 3B** schematic wiring diagram, a 12-volt DC to 9-volt DC power converter/filter/regulator **315** is further specified and built into the cigarette lighter plug **312** such that, for example, no more than 9 volts DC and 200 milliamps is provided by means of the cigarette lighter plug **312** to the GPS receiver **2**. Connector detail in **FIGURE 1B** is shown from the crimp/solder side; other pins are loaded but not connected; at **310** and **309**, 28 AWG wire is

specified. Other features shown in **FIGURES 3A** and **3B** will be quite obvious to one skilled in the art.

FIGURES 4A and **4B** illustrate further details of the second type of optional cable for connecting the PPC **1** and the GPS receiver **2**, corresponding to cabling **20** in **FIGURE 1C**. In **FIGURES 4A** and **4B**, a COM port connector **421** (specified as a DB-9 female) and a keyboard/mouse connector **422** (specified as a 6-pin mini DIN fitting) correspond to components **21** and **22** respectively in **FIGURE 1C**. The COM port data cable and the keyboard/mouse port power cable join in a "Y" configuration in **FIGURES 4A** and **4B** at **423** (specified as a DB-9 male connector) which corresponds to location **23** in **FIGURE 1C**. Other features shown in **FIGURES 4A** and **4B** will appear obvious to one skilled in the art.

FIGURES 5A, 5B and **5C** present physical layouts showing an overview of a GPS receiver printed wiring board or PWB **505** in a GPS case **502**, and a standard battery power base at **531**, and an optional external power base **539**, respectively. The GPS receiver case **502** was shown heretofore at **2** in **FIGURES 1A, 1B** and **1C**, and at **200** in **FIGURE 2A**. The PWB **505** was shown at **202** both in **FIGURES 2A** and **2B**. The standard battery power base **531** was shown at **6** in **FIGURE 1A** and at **210** in **FIGURE 2A**. The external power bas **539** was shown in less detail at **15** in **FIGURES 1B** and **1C**, with a detailed side view presented at **220** in **FIGURE 2B**. As should be obvious to a skilled technician from all these drawings, the **531** standard battery power base and the **539** optional external power base involve alternate bottom covers for the GPS receiver case at **502** in **FIGURES 5A, 5B** and **5C**.

FIGURE 5A shows an attached GPS data/power cable **503**, corresponding to cable **3** in **FIGURES 1A, 1B** and **1C** and cable **203** in **FIGURES 2A** and **2B**. In relation to **FIGURE 5A**, **504** is specified as a DB-9 female connector; **507** is Data Out; **509** is Data In; **511** is Data Terminal Ready; **513** is Power Ground/Signal Reference; and **515** is DC Power In. **517** is the Power Ground; **519** is External Power; and **521** is Battery Power In – feeding a three-position male power supply trunk **525** in **FIGURE 5A**. The other features shown in **FIGURES 5A, 5B** and **5C** will appear obvious to one skilled in the art.

With continuing reference to the coupling of the power supply components of the present invention shown in **FIGURES 5A-5C**, there is specified a power supply trunk that is shown preferably as a three-position male connector **525** corresponding to the power supply trunk **205** for the PWB **202** as shown in **FIGURES 2A** and **2B**. The three-position male connector **525** mates with a three-position female connector or jumper **533** for the standard battery power base in **FIGURE 5B**, and also mates with an identical, identically placed but differently wired three-position female connector **545** on the external power base **531** in **FIGURE 5C**. Thus, whether an internal battery or an external power is provided to the GPS receiver PWB board **505** is determined by the power base chosen and installed by the user – in conjunction with positive (+) **535** and negative (-) **537** battery power lines in **FIGURE 5B** or the external power jumper at **543** in **FIGURE 5C**. That is, when the standard battery power base **531** is coupled to the GPS receiver case **502**, internal power is supplied to the GPS receiver **2** through the coupling of positive terminal **535** to terminal **521** and negative terminal **537** to terminal **517**, with terminal **519** left open. On the other hand, when the external power supply case **539** is coupled to the GPS receiver case **502**, external power through connection **515** is supplied to the GPS receiver **2** through the coupling of terminals **519** and **521** to the terminals of external power jumper **543**.

The invention description herein is directed to a specific embodiment, however, it is apparent that many modifications and variations could be implemented by one skilled in the art without departure from the spirit and scope of the novel concepts of the present invention.

I CLAIM:

1. A device for supplying power to a global positioning system (GPS) receiver and for coupling the GPS receiver to computer means for an interchange of data therebetween, said device comprising:

a. an adaptive removable power supply base attachable to the GPS receiver and to an external power source; and

b. an interface cabling system including a first end for coupling to the GPS receiver and a second end for coupling to the computer means.

2. The device as claimed in **Claim 1** wherein said interface cabling system includes:

a. means for coupling to a data communications port of the computer means; and

b. means for coupling said removable power supply base to the external power source.

3. The device as claimed in **Claim 2** wherein said interface cabling system includes:

a. a first cable having a first GPS receiver end for coupling to the GPS receiver; and

b. a second cable having a coupling end for coupling to said first cable, and a data/power end for coupling to said data communications port of the computer means and to the power source.

4. The device as claimed in **Claim 3** wherein said data/power end of said second cable includes a data cable for coupling to said data communications port, and a separate power cable for coupling to the power source.

5. The device as claimed in **Claim 4** wherein said separate power cable is designed to couple said second cable of said interface cabling system to an external power source.

6. The device as claimed in **Claim 5** wherein said separate power cabl includes an adaptive end for coupling to an automobile power outlet.

7. The device as claimed in **Claim 6** wherein said adaptive end is designed to fit an automobile cigarette lighter outlet.

8. The device as claimed in **Claim 4** wherein said separate power cable includes an adaptive end designed to couple said second cable of said interface cabling system to a power source connector of the computer means.

9. The device as claimed in **Claim 8** wherein said adaptive end of said separate power cable is designed to couple said second cable to a keyboard port of the computer means.

10. The device as claimed in **Claim 8** wherein said adaptive end of said separate power cable is designed to couple said second cable to a mouse port of the computer means.

11. The device as claimed in **Claim 8** wherein an adaptive end of said data cable is a DB-9 female connector and said coupling end of said second cable includes a DB-9 male connector for coupling said second cable to said first cable, and wherein said adaptive end of said separate power cable is a 6-pin mini DIN fitting.

12. The device as claimed in **Claim 4** wherein an adaptive end of said data cable is a DB-9 female connector and said coupling end of said second cable includes a DB-9 male connector for coupling said second cable to said first cable.

13. The device as claimed in **Claim 12** wherein said separate power cable includ s an adaptive end for coupling to an automobile power outlet, and wherein said adaptive end is coupled through a voltage regulator to said DB-9 male connector.

14. A device capable of supplying power to a Global Positioning System (GPS) receiver and capable of exchanging data between the GPS receiver and computer means, the device comprising a combination data/power cable having a plurality of conductive leads, wherein a first portion of said conductive leads are data coupling leads for providing interfacing between a data port of the computer means and a data port of the GPS receiver, and wherein a second portion of said plurality of conductive leads are power coupling leads for optionally providing power to the GPS receiver.

15. The device as claimed in **Claim 14** wherein the GPS receiver includes an independent battery pack for supplying power thereto and wherein said power coupling leads are inactive when said combination data/power cable is coupled to the data port of the computer means.

16. The device as claimed in **Claim 14** wherein the computer means includ s a mouse port, said device further comprising an adaptive second cable having a first coupling end for connecting to said combination data/power cable, and a second coupling end having a separate data terminal for coupling to the data port of the computer means and a separate power terminal for coupling to the mouse port of the computer means.

17. The device as claimed in **Claim 14** further comprising an adaptive second cable having a first coupling end for connecting to said combination data/power cable, and a second coupling end having a separate data terminal for coupling to the data port of the computer means and a separate power terminal for coupling to an independent power supply.

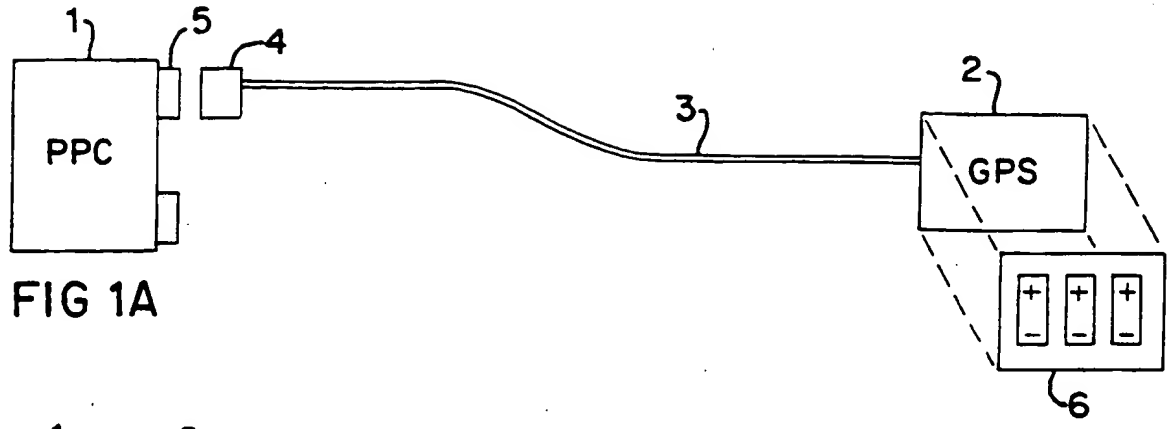

FIG 1A

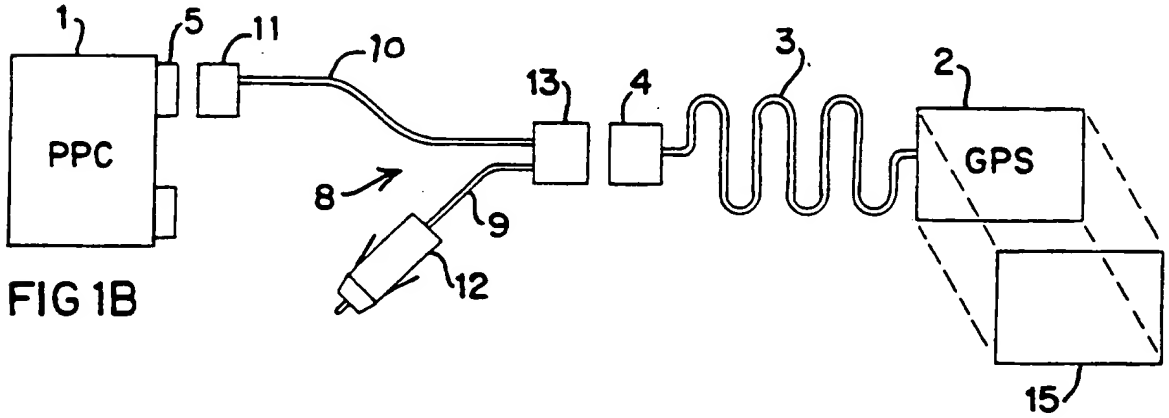

FIG 1B

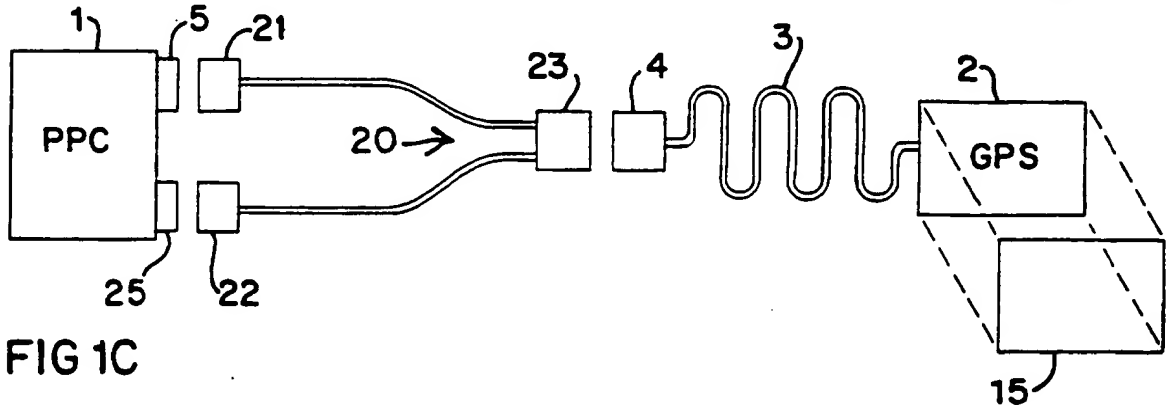

FIG 1C

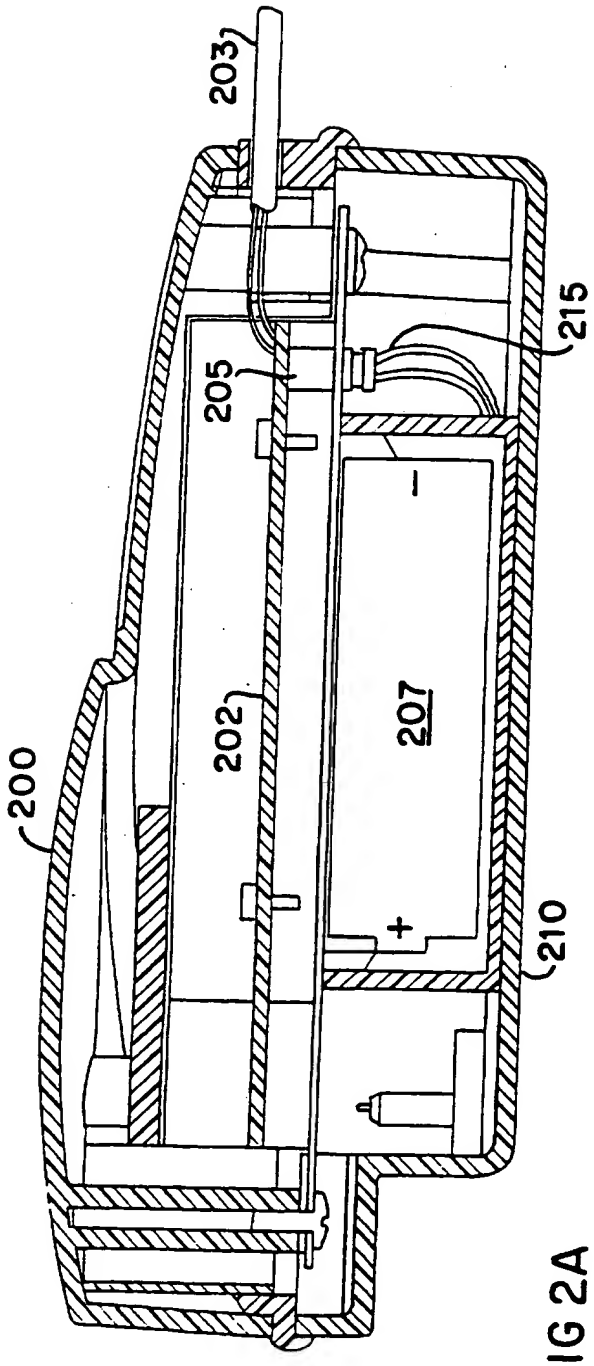

FIG 2A

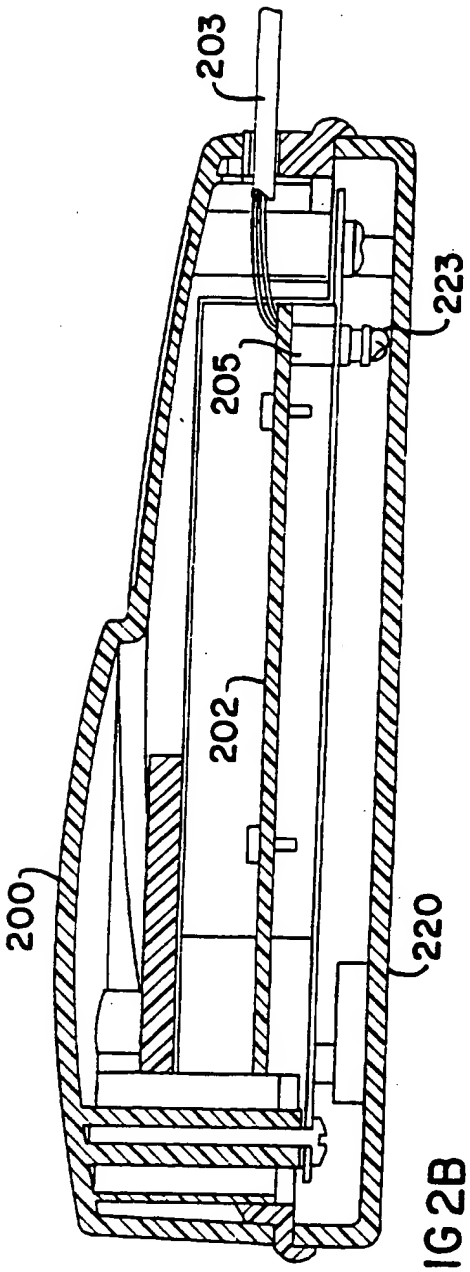

FIG 2B

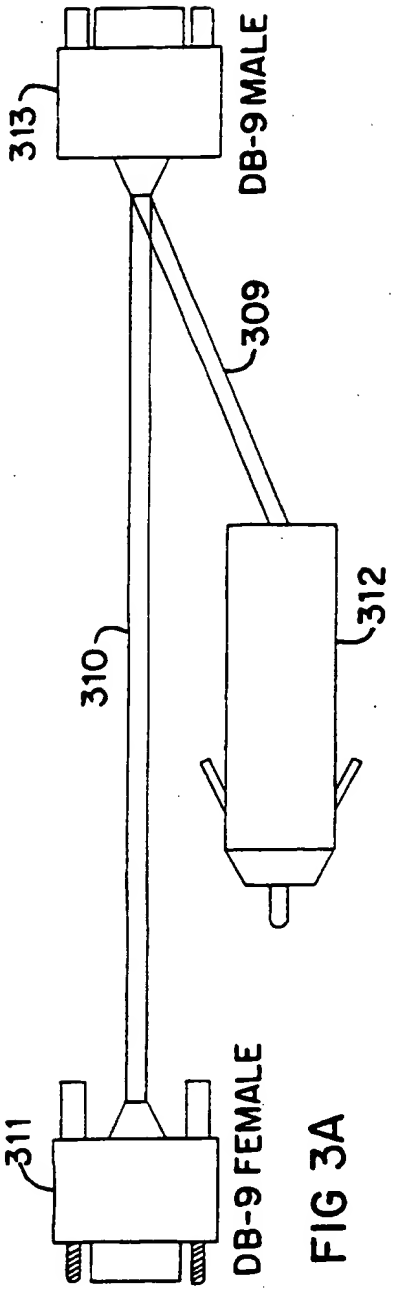

FIG 3A

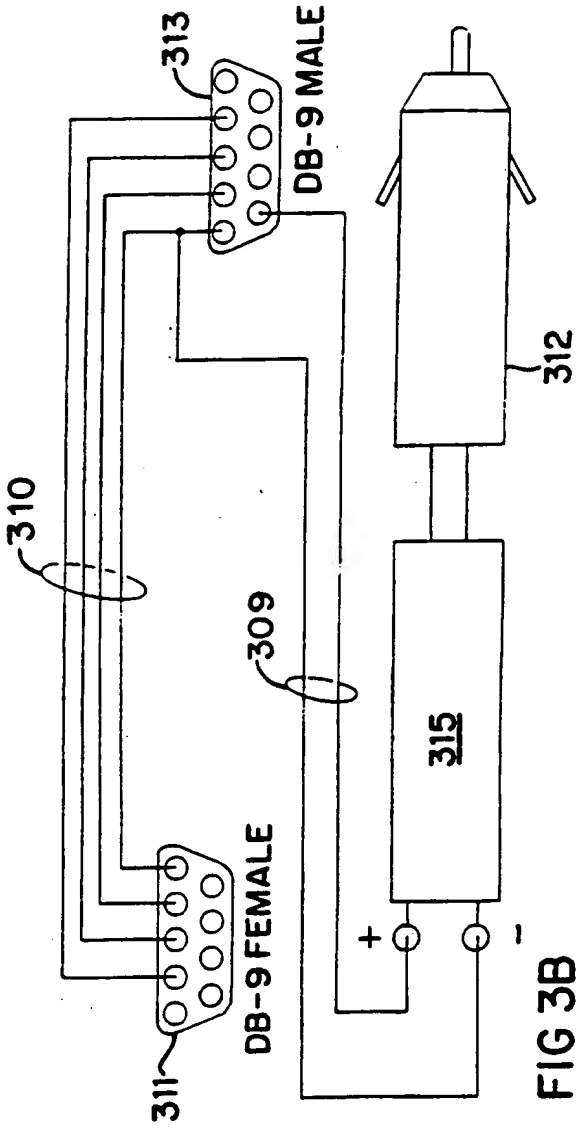

FIG 3B

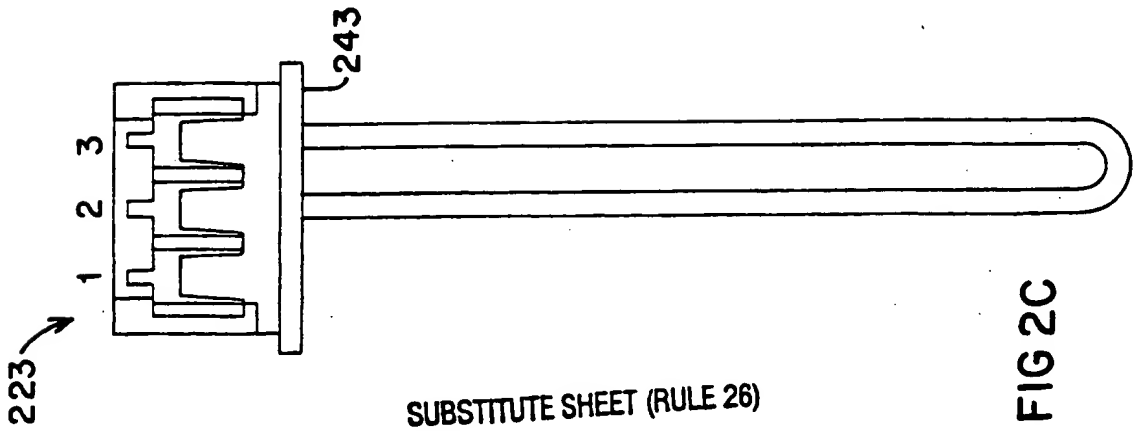

FIG 2C

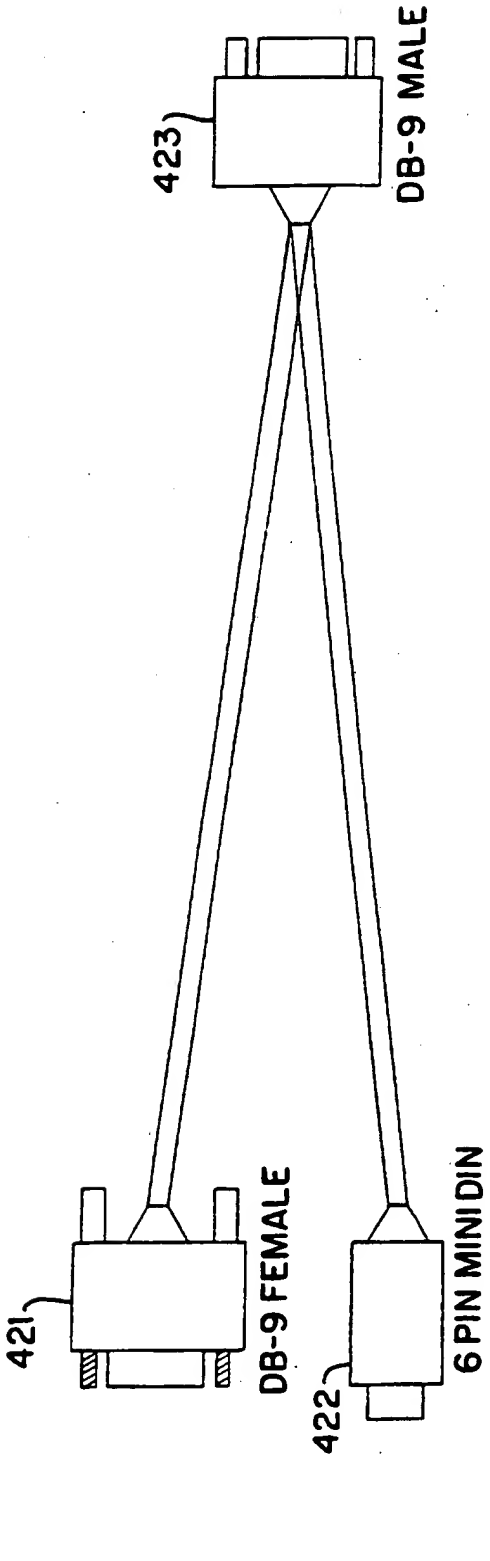
423
DB-9 MALE
421
DB-9 FEMALE
422
6 PIN MINI DIN

FIG 4A

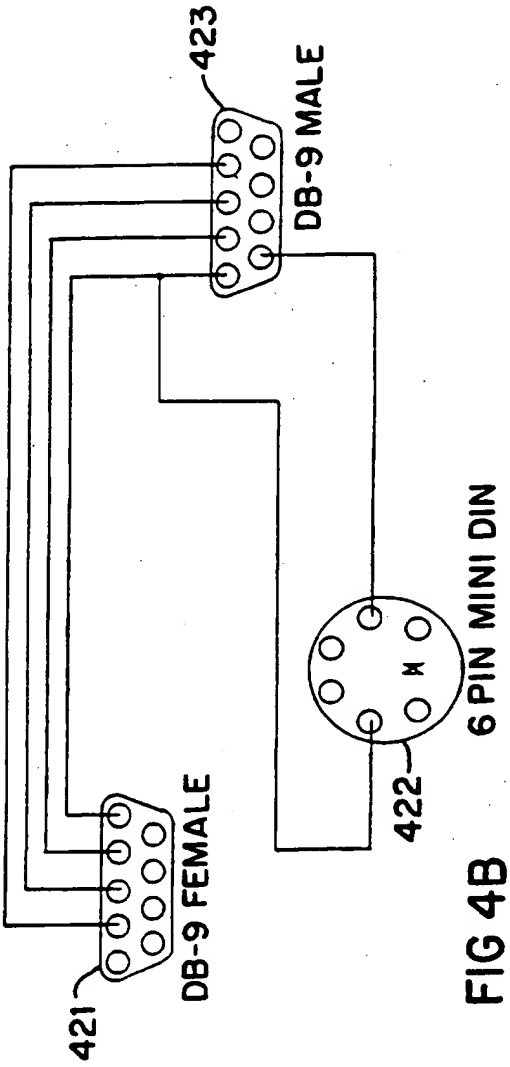
423
DB-9 MALE
421
DB-9 FEMALE
422
6 PIN MINI DIN

FIG 4B

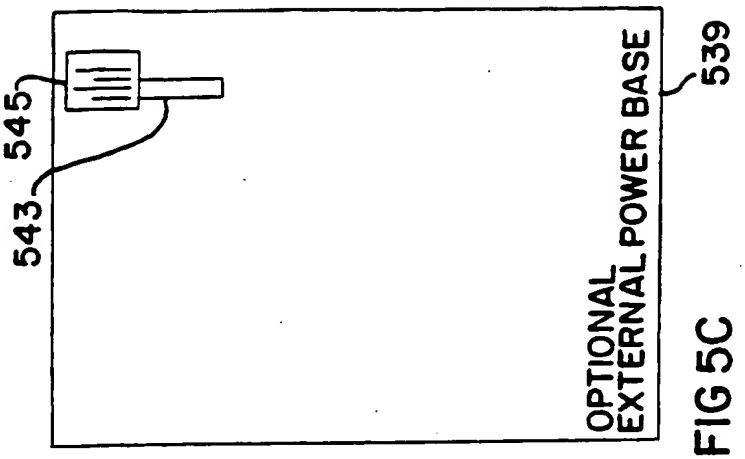

FIG 5C

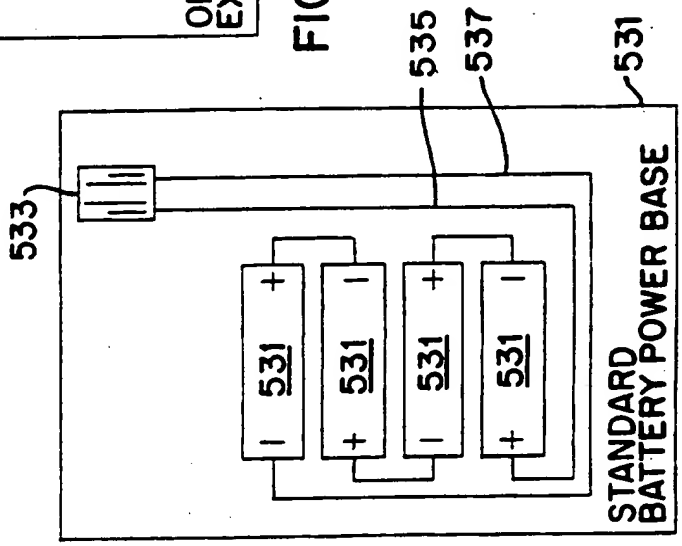

FIG 5B

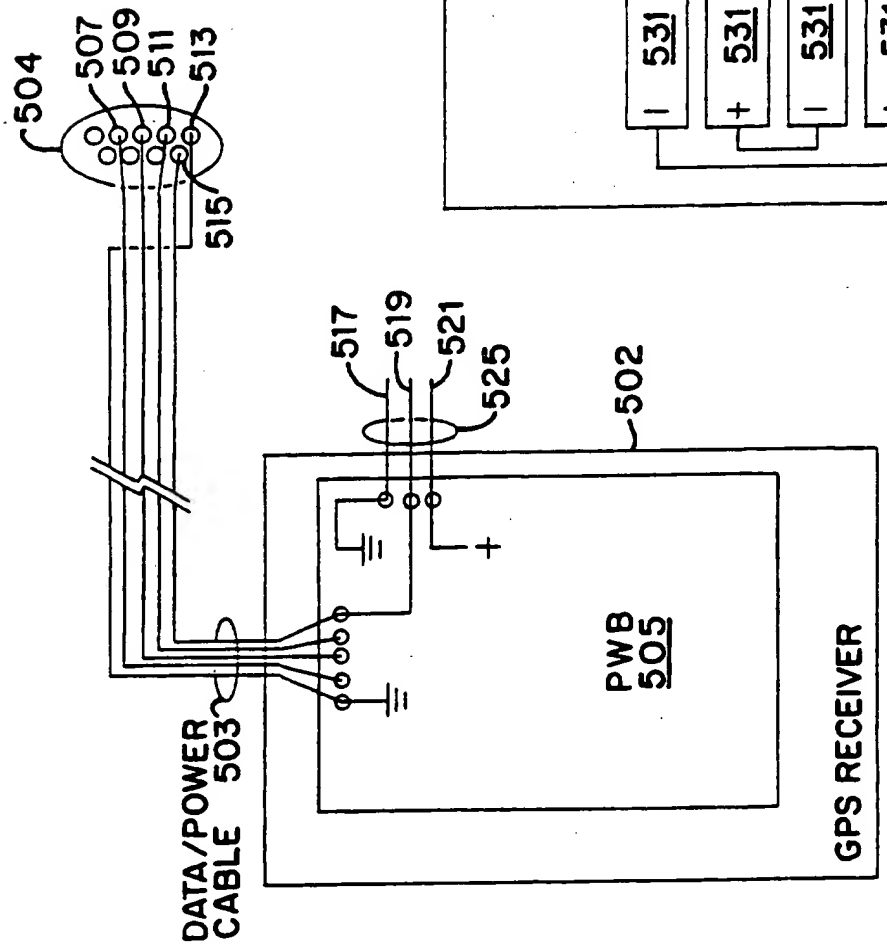

FIG 5A

INTERNATIONAL SEARCH REP RT

International application No.
PCT/US97/16429

A. CLASSIFICATION F SUBJECT MATTER
IPC(6) :H04L 23/00
US CL :375/377; 364/492, 705.05, 707, 708.1; 455/349, 351, 572, 575
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. :

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Please See Extra Sheet.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y,E	US 5,675,524 (BERNARD) 07 October 1997, see entire document, especially column 4, lines 33-47.	1-17
Y	US 5,532,524 (TOWNSLEY et al) 02 July 1996, page 1, abstract, entire document, especially column 6, lines 57-63.	1-13
Y	US 5,517,683 (COLLETT et al) 14 May 1996, see entire document claims 1-12, and especially columns 8-9 lines 35-67, and 1-21 respectively.	1-17
Y	US 5,497,339 (BERNARD) 05 March 1996, see entire document especially, column 3, lines 59-67, and 1-9 respectively.	1-17

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search	Date of mailing of the international search report
12 NOVEMBER 1997	26 JAN 1998
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer JOSEPH ROUNDTREE Telephone No. (703) 306-3033

Form PCT/ISA/210 (second sheet)(July 1992)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/16429

B. FIELDS SEARCHED
Electronic data bases consulted (Name of data base and where practicable terms used):

STN/APS: remote external power (supply, source, connector, cable), removable, detachable, attachable, communication port, com port, power interface, data communications (port, interface), communication port, and GPS

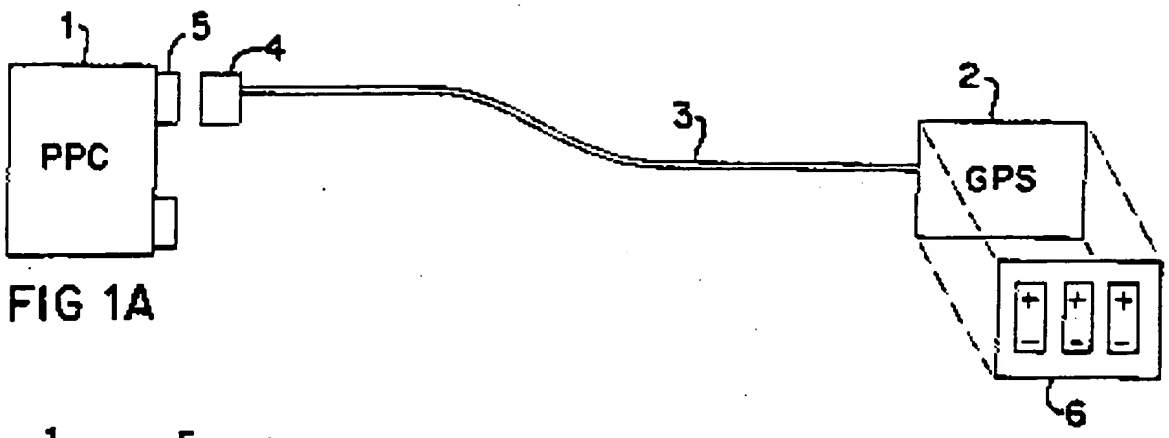

FIG 1A

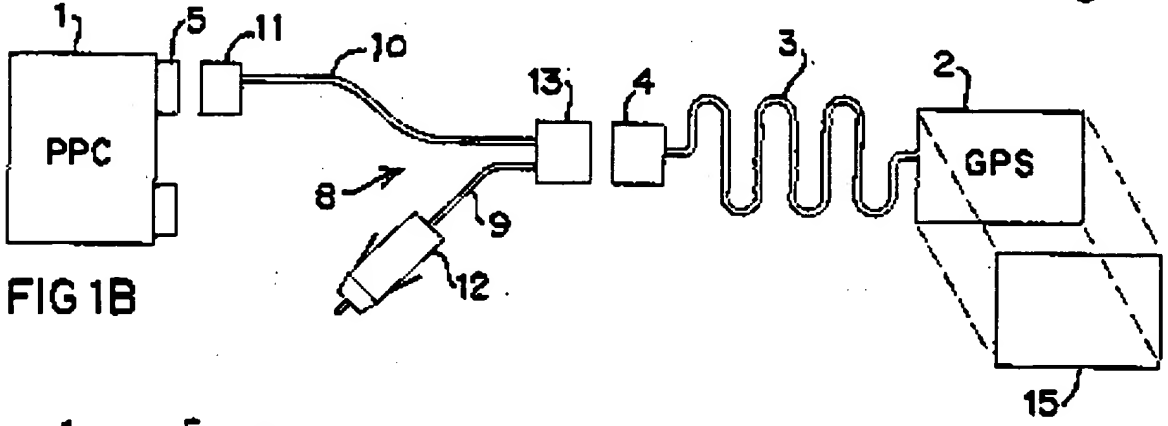

FIG 1B

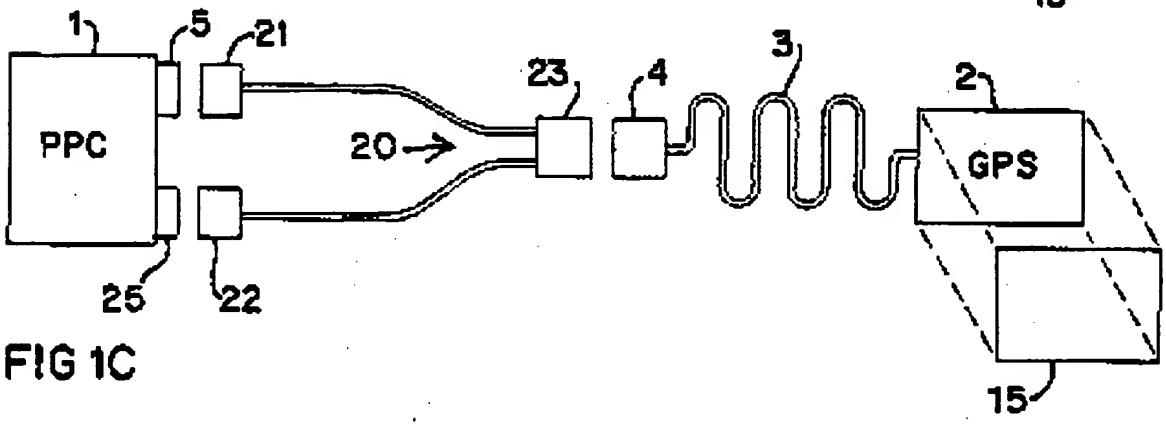

FIG 1C

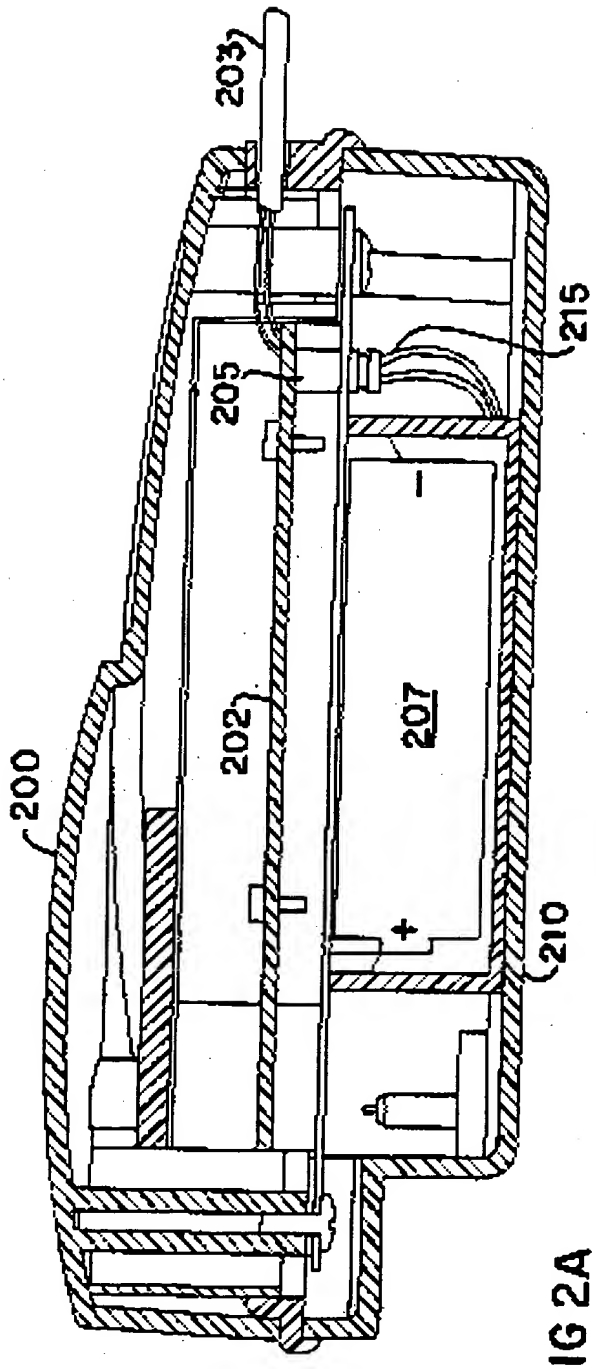

FIG 2A

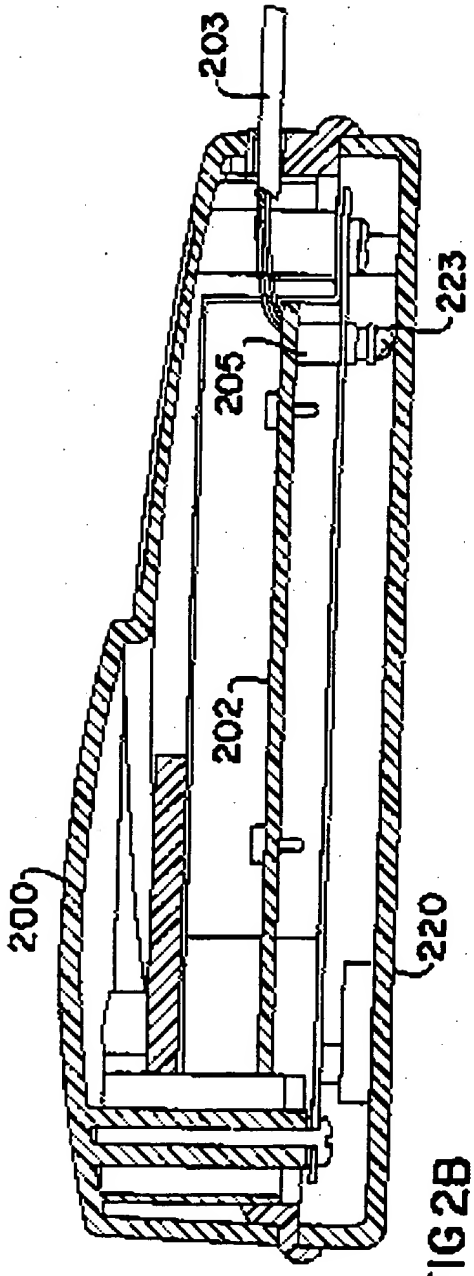

FIG 2B

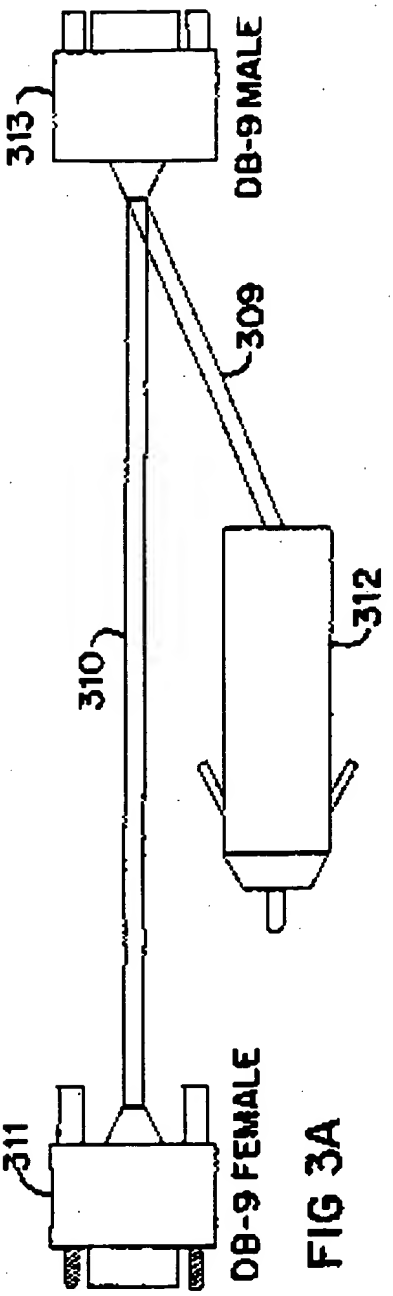

FIG 3A

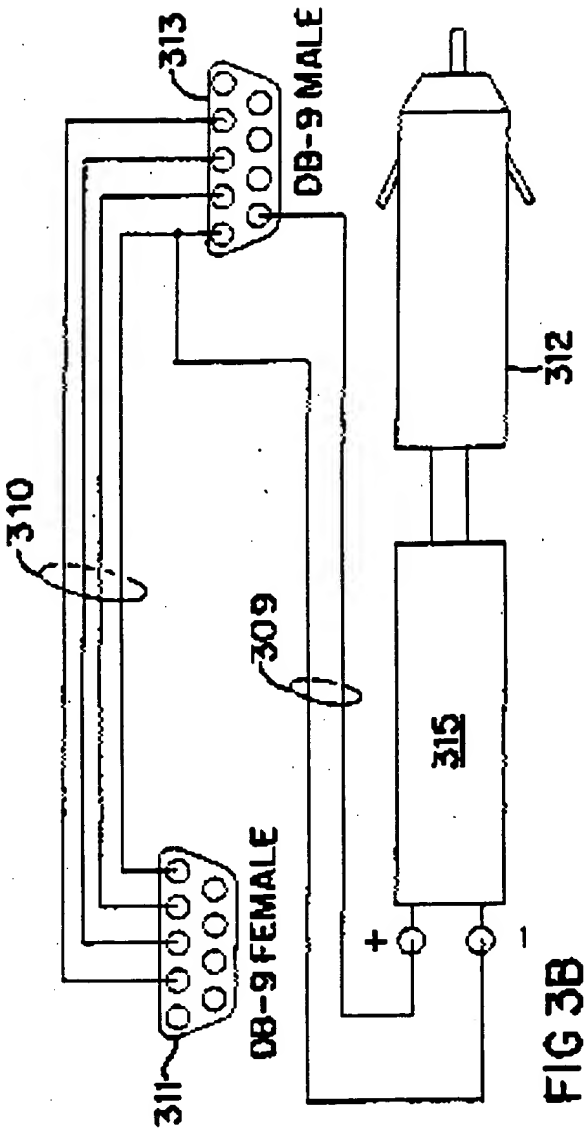

FIG 3B

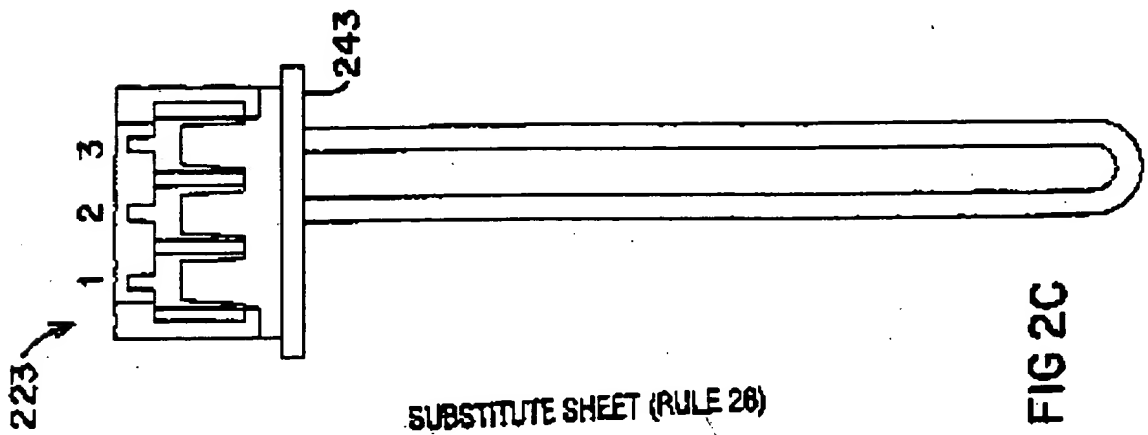

FIG 2C

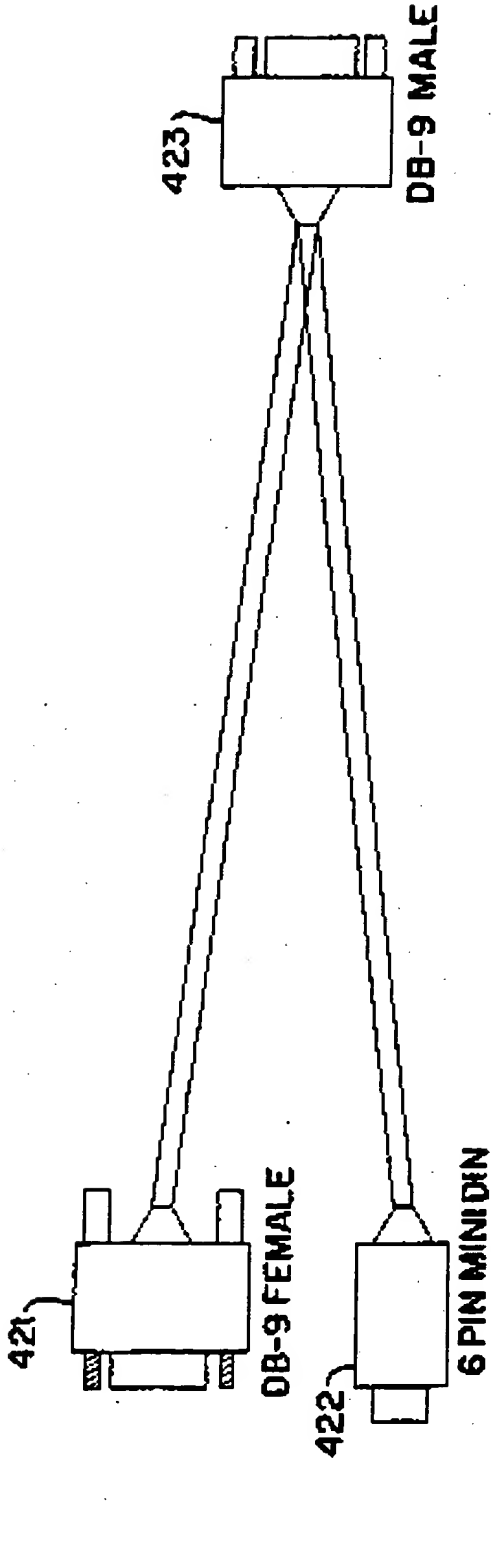
423
DB-9 MALE
421
DB-9 FEMALE
422
6 PIN MINI DIN

FIG 4A

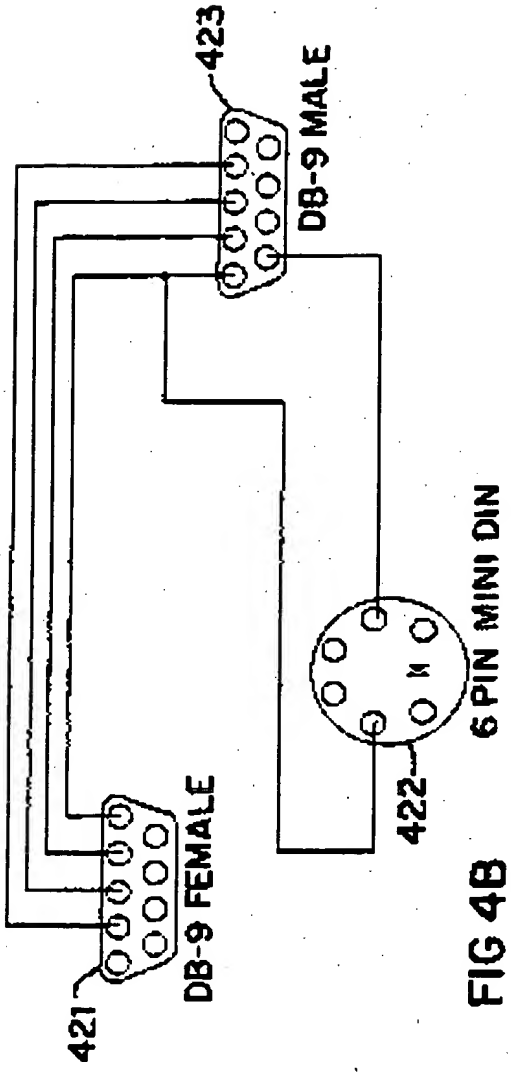
423
DB-9 MALE
421
DB-9 FEMALE
422
6 PIN MINI DIN

FIG 4B

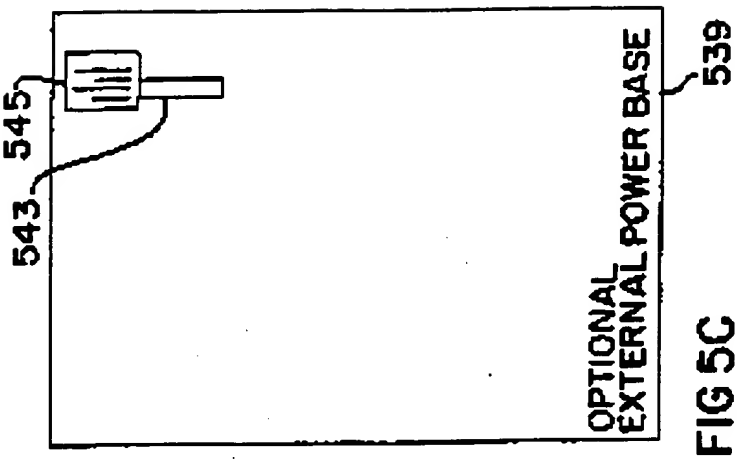

FIG 5C

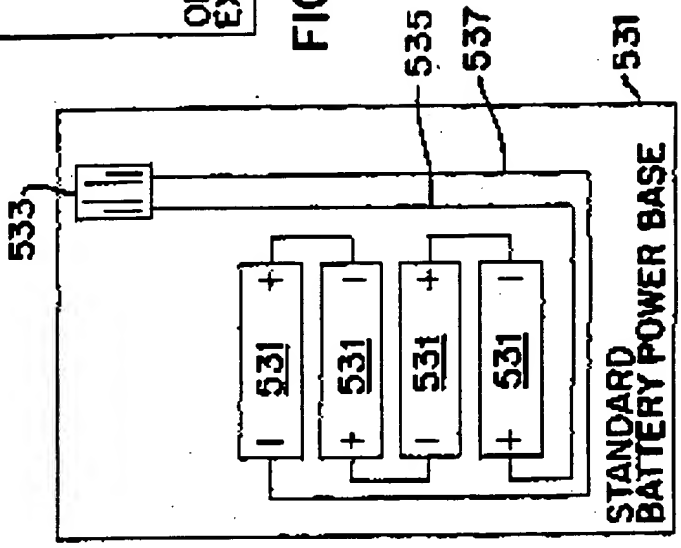

FIG 5B

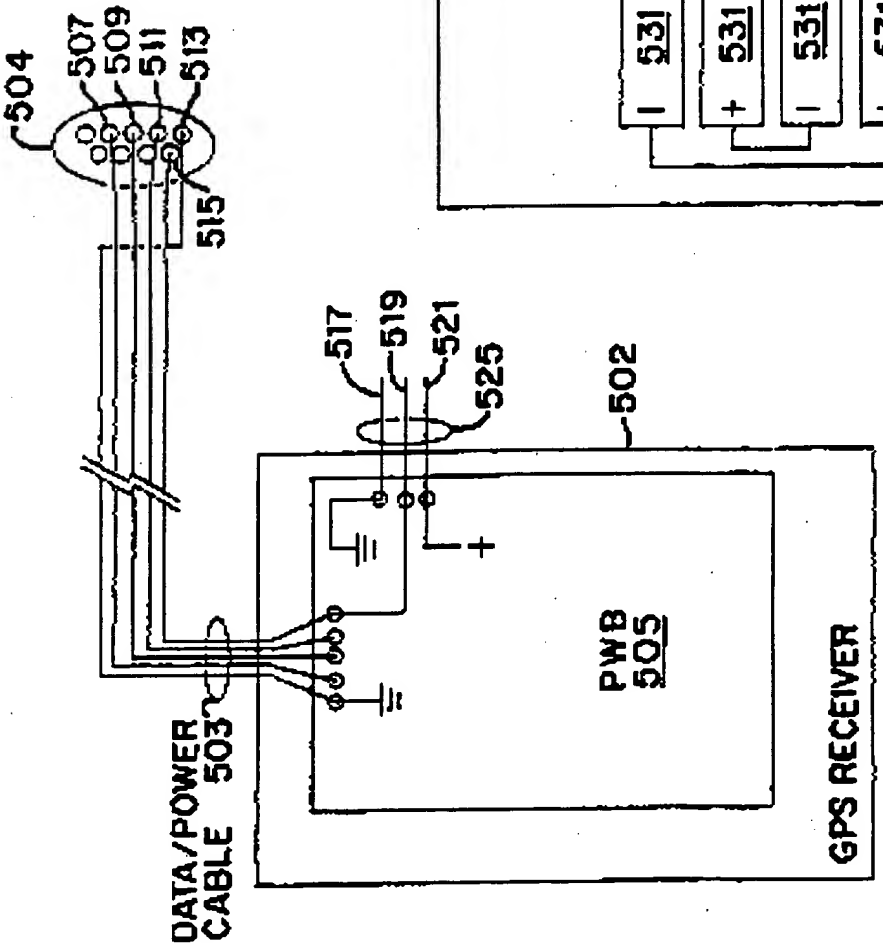

FIG 5A